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(54) Bar code reader

(57) A static bar code reader consists of a reading head formed by a moulding (3), which carries a set of optical fibres (4) arranged in a straight line. This head is placed over the code to be read and light reflected from that code, which is "modulated" in accordance with that code is conveyed via the fibres to electronic reading circuitry. This latter may include CCD's whose outputs are scanned and the scanned result applied to a decoder. The moulding is preferably transparent to facilitate head location. Light supply to the head is either ambient light, light from a source conveyed to the head via another set of optical fibres, or light from a linear lamp in the head. For reading telephone numbers from a directory the head has an extension portion of cylindrical lens form which is placed over the line of print associated with the bar code.

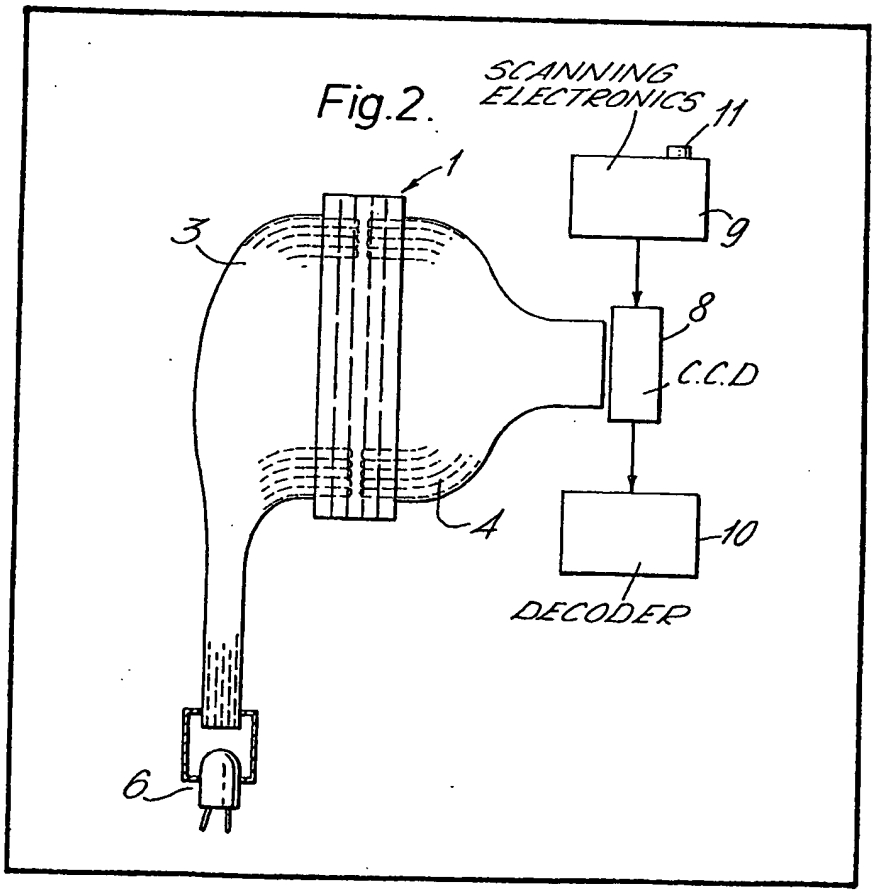

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Fig.1.

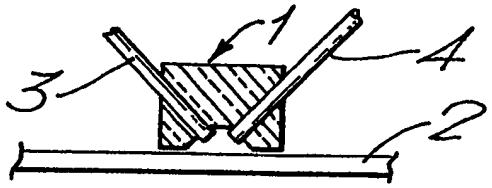


Fig.2.

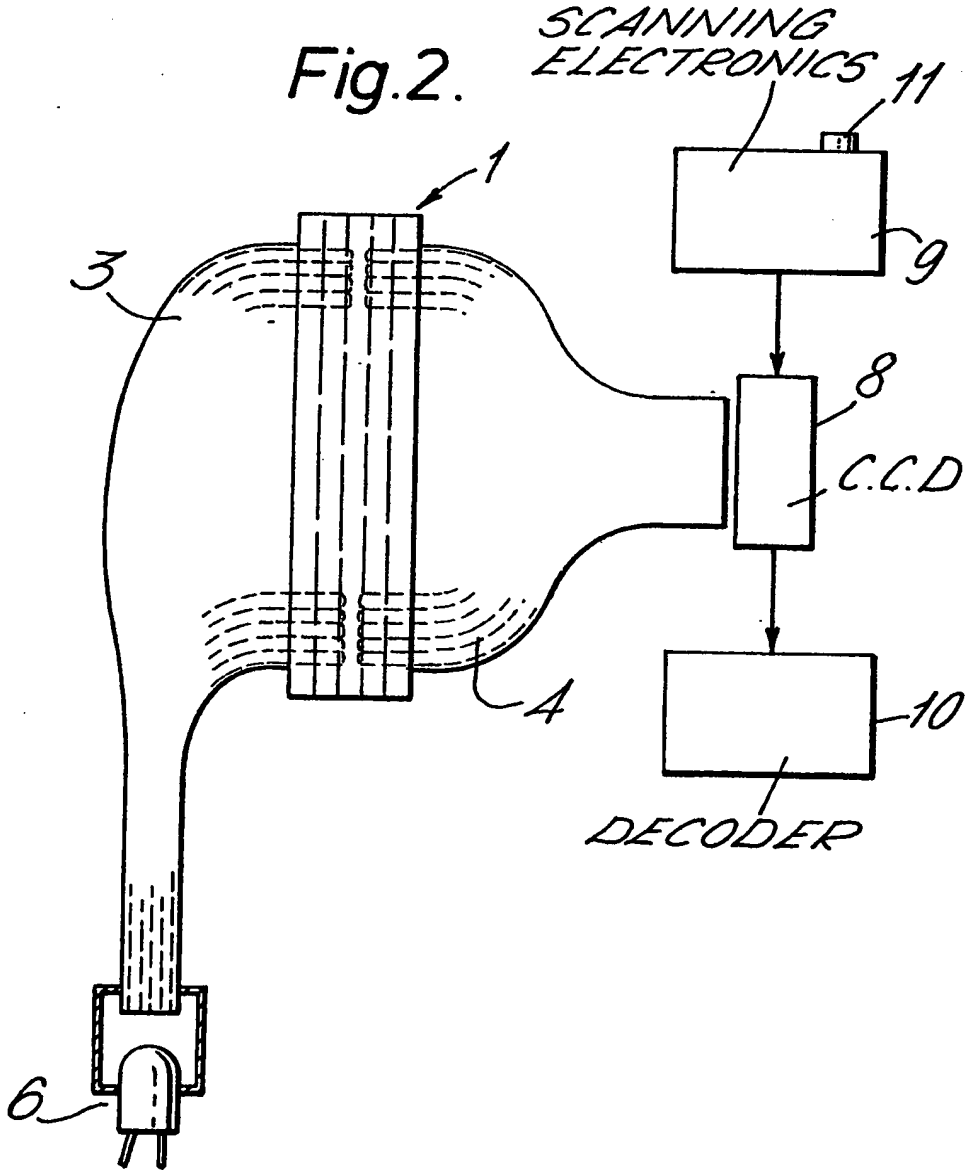


Fig.3.

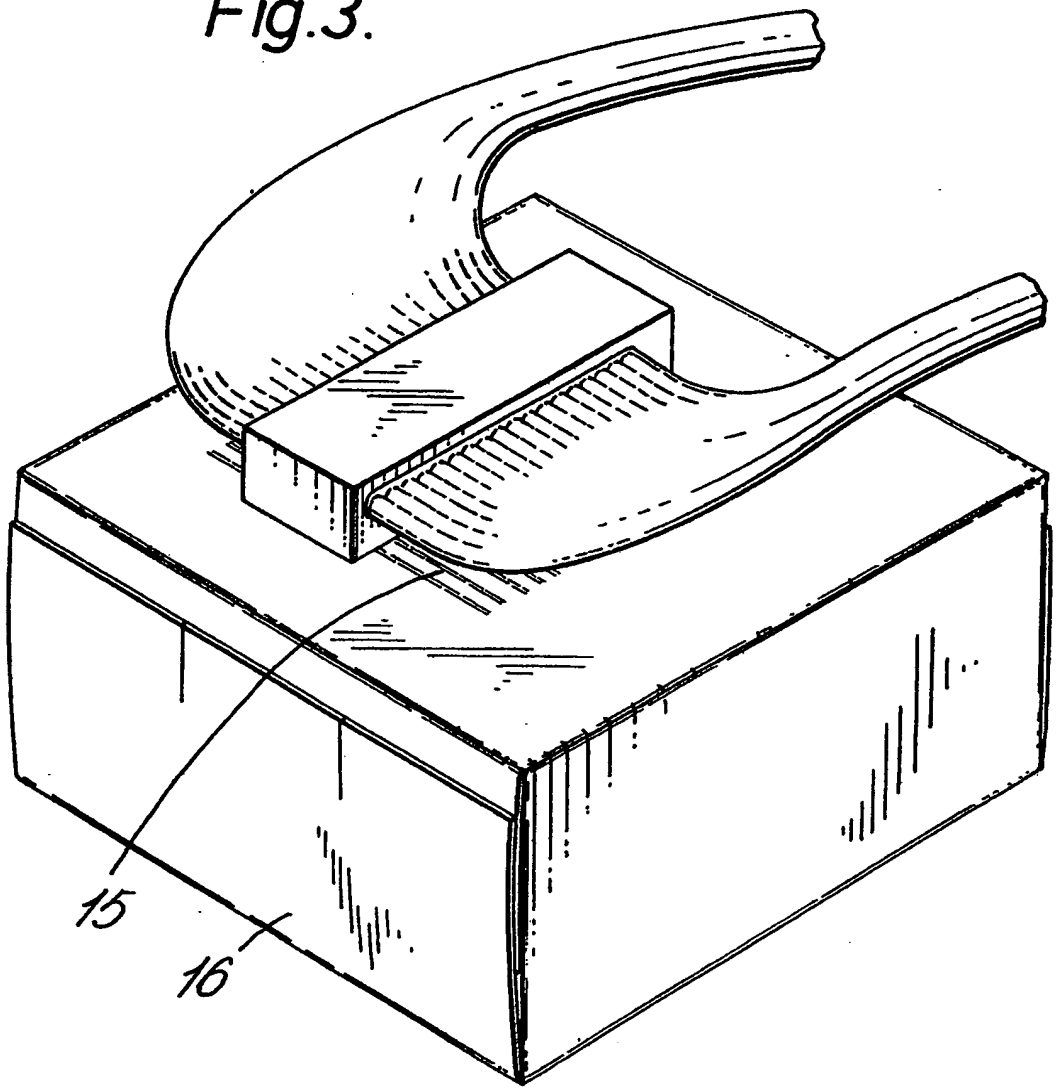


Fig.4.

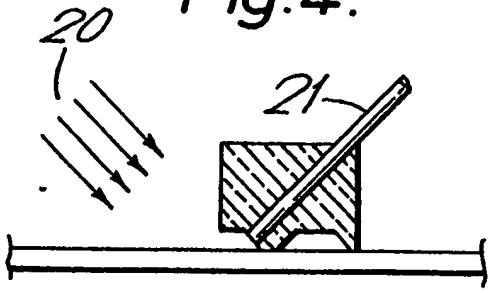
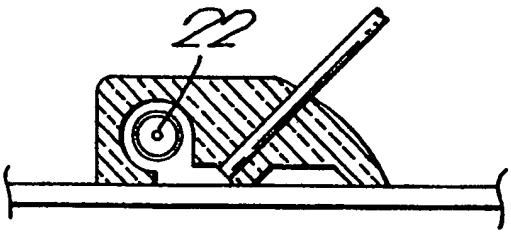


Fig.5.



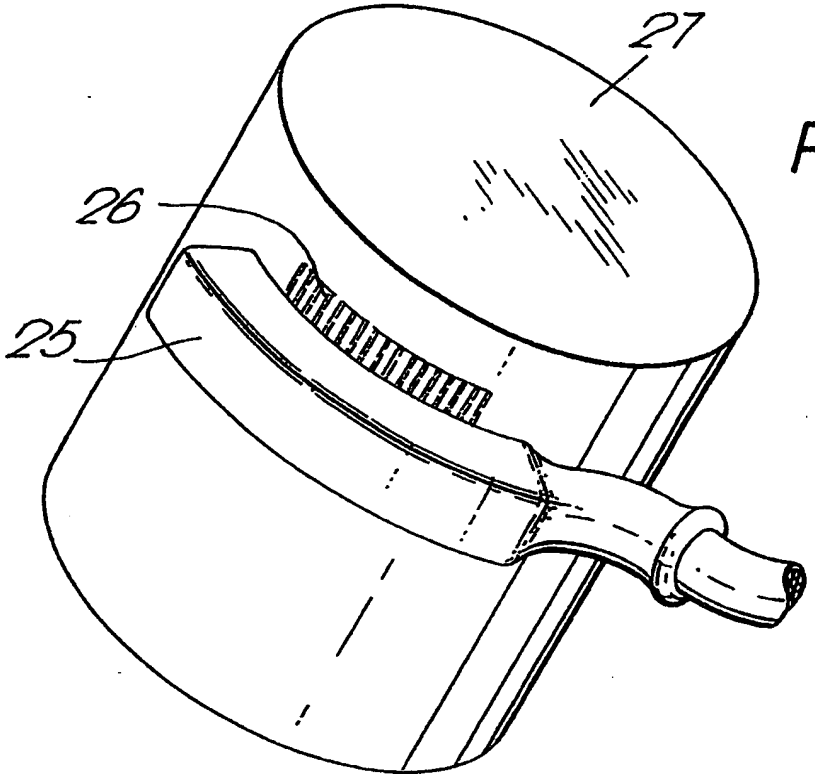


Fig.6.

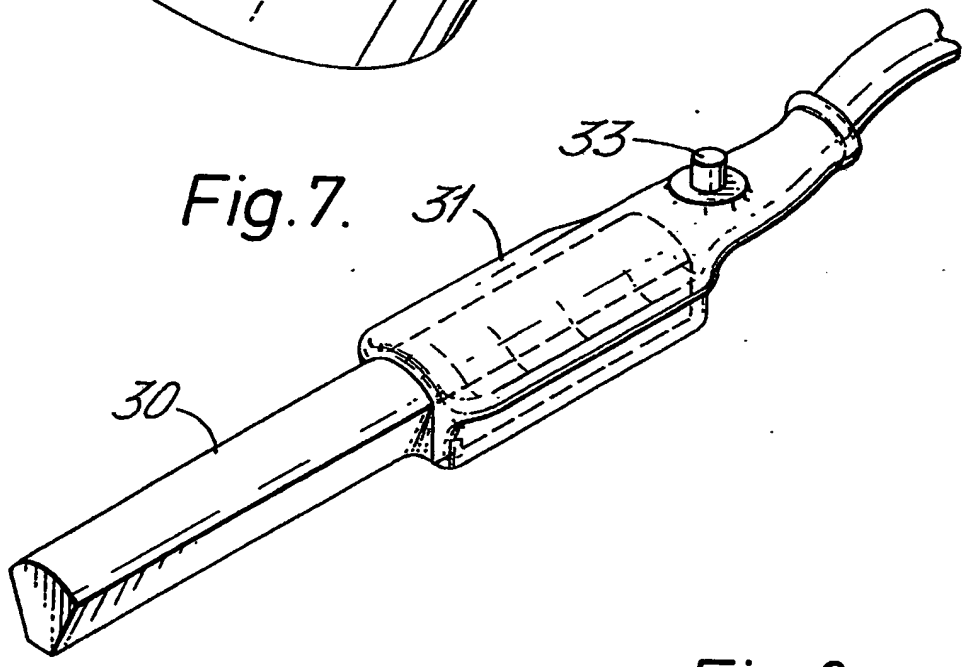


Fig.7.

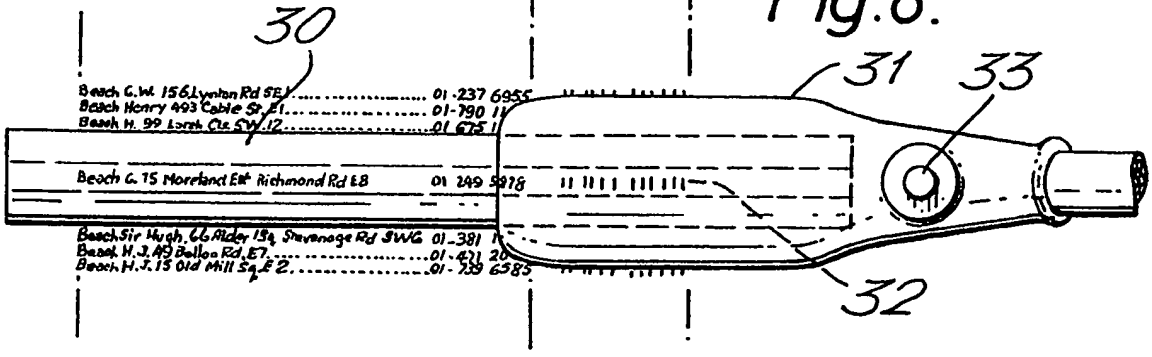


Fig.8.

SPECIFICATION

Bar code reader

This invention relates to bar code readers.

Bar codes are coming more and more into use, especially on food products as sold in supermarkets, although it will be appreciated that bar codes are of much wider application. Hence it is an object of this invention to enable the production of cheap and simple bar code readers.

According to the invention there is provided an optical bar code reader, which includes a reading head housing an array of optical fibres whose ends are in a linear array which when in use is placed adjacent to and aligned with the length of a bar code to be read, electronic devices each responsive to light reflected from the bar code being read, and a scanning circuit associated with said electronic devices and adapted when energized to cause the conditions of said electronic devices, and thus the bar code with which the fibre ends are aligned, to be read.

Such a reader is a static device in that it is placed over the code to be read and switched on, whereafter the electronic circuiting causes the bar code to be scanned. This is by contrast with many known code readers, which have to be moved or wiped along the length of the bar code. Thus the novel code readers do not cause wear to the surface on which the code is printed, which is significant in such applications as the reading of bar code representations of telephone numbers.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which

Fig. 1 shows the basic element of a first bar code reader embodying ths invention

Fig. 2 shows schematically the arrangement of such a code reader

Fig. 3 shows how such a code reader is used

Figures 4 and 5 are representations similar to Fig. 1 of further embodiments of the invention

Fig. 6 shows a bar code reader embodying the invention for reading from a curved surface

Figs. 7 and 8 show a bar code reader embodying the invention and specially adapted for reading a bar code representation of a telephone number.

In Fig. 1 is a part section of one element of a bar code reader, and it includes a moulding 1 which is placed close to or in actual contact with a surface 2 on which a bar code to be read is printed. This moulding 1 contains an array of optical fibres such as 3 via which light is supplied to the code to be read and another array of fibres such as 4 via which light is conveyed to the electronics for reading the code. The light as conveyed to the electronics is thus "modulated" in accordance with the code to be read.

The moulded block 1 which carries the two sets of optical fibres is preferably of transparent material, e.g. a polymerized methyl methacrylate plastics, so that the user can see the bar code through the block. Thus he can see to locate the reader correctly before reading occurs.

Fig. 2 shows the overall arrangement of the reader, which includes a lamp or light emitting diode 6 from which light is fed via the "supply" fibres 3 to one side of the reader head, i.e. the moulding 1. The output fibres 4 extend to the electronics, which in this case includes an array of charge coupled devices 8 which connect the light patterns reflected from the code being read into an electrical form. Associated with this is scanning electronics 9 and a decoder 10.

To read the code the user positions the head formed by the moulding 1 over the code and when satisfied that it is correctly located, presses a button 11, which energizes the scanning electronics 9 as a result of which the code is read and the result applied to the decoder 10, which gives an output identifying the code read.

The pitch of the fibres in the reading head is close enough that finely spaced code lines are accurately read. The pitch of the output fibres at the CCD block 8 is as small as each other, perhaps with the fibres touching each other, so that as many as possible can be encompassed by the CCD's.

Fig. 3 shows how the reader is used. It is placed on the bar code 15 as printed on the carton (or the like) 16 so that the full length of the code is under the reading head. The read push-button (or equivalent) is operated to cause the CCD elements to scan the array of fibres from end to end, probably a number of times in a fraction of a second, so that the decoding circuitry can perform checks on the read-out. This circuitry, as in known devices, correctly interprets the code whether it is read in the correct direction or in the opposite direction.

Fig. 4 shows a reading head element for a head with only one set of fibres. Here the code to be read is illuminated by ambient light as indicated at 20, with a single set of fibres such as 21 to convey the reading pattern to the associated electronics.

Fig. 5 shows another alternative to the use of optical fibres to supply the light. Here the head includes a linear lamp 22 to illuminate the bar code. This is only suitable for reading from a flat surface.

Fig. 6 shows a reading head 25, which is of flexible material so that it can be bent to a read bar code 26 from a cylindrical outer surface of a can or bottle 27.

Such a code reading method does not damage the code surface, as can happen with a moving parts reader. This is important when reading codes printed in a catalogue or a telephone number in a directory since it does not reduce the useful life of the book. Another advantage of a static reader is that reading is unaffected by the user's speed of movement of a probe, the reading speed being dependent on the scanning characteristics of the CCD circuitry.

If the reading head is of transparent material, it is easy for the user to see that he has correctly positioned it over the printed code before reading takes place. Thus if printed bar codes are on

adjacent lines, as in a telephone directory it is easy to correctly position it over the wanted line. Hence it will be seen that the present static readers are well suited to auto dealing of telephone calls.

An "auto-dial" reading head is shown in Fig. 7. This has an end portion 30 which is a transparent moulding made in cylindrical lens form so that when placed over a telephone directory as in Fig. 8 a broadened image of the verbal portion of the entry is obtained, the read head proper 31 being then over the bar code 32. The press-to-read push-button is shown at 33: when this is operated the wanted number's bar code is read, and the electrical representation thereof sent to an auto-dialler (not shown).

Claims

1. An optical bar code reader, which includes a reading head housing an array of optical fibres whose ends are in a linear array which when in use is placed adjacent to and aligned with the length of a bar code to ba read, electronic devices each responsive to light reflected from the bar code being read, and a scanning circuit associated with said electronic devices and adapted when energized to cause the conditions of said electronic devices, and thus the bar code with which the fibre ends are aligned, to be read.

2. A code reader as claimed in claim 1, in which light is supplied to the code to be read by the ambient light.

3. A code reader as claimed in claim 1, in which the reading head includes a second set of optical fibres whose ends terminate adjacent to the ends of the first-mentioned set of optical fibres and which supply light to the code to be read from an aritificial light source.

4. A code reader as claimed in claim 1, in which the reading head includes a linear electric lamp so mounted as to shine light on a bar code to be read.

5. A code reader as claimed in claim 1, 2, 3 or 4, in which the reading head is of transparent material.

6. A code reader as claimed in claim 1, 2, 3, 4, and 5, in which the reading head is of flexible material, to facilitate reading from a curved surface.

7. A code reader as claimed in claim 6 and which has an extension portion aligned with the reading head and of transparent material so as to facilitate the use of the reader for reading a bar code aligned with a line of print, said extension portion being of cylindrical lens portion.

8. A code reader as claimed in any one of the preceding claims and in which the electronic devices which respond to the light pattern from a code to be read are charge-coupled devices.

9. An optical bar code reader, substantially as described with reference to Fig. 1, 2, 3, 4, 5, or 6 and 7 of the accompanying drawings.

New claims or amendments to claims filed on 1st July 1982

New or amended claims:—

10. A static optical bar code reader, which includes a reading head having an array of optical fibres whose ends are in a linear array, which reading head when in use is placed closely adjacent to and in alignment with the length of a bar code to be read, the head being maintained stationary during the reading, electronic devices responsive to light reflected into the fibre ends from the bar code to be read, and a scanning circuit associated with the electronic devices and adapted, when energized, to cause the conditions of the electronic devices, and thus the bar code, to be read, the arrangement being such that a said bar code can be read without relative movement between the bar code and the reading head.

11. A method of reading a bar code optically which includes placing a reading head adjacent to, in engagement with, and in alignment with, the bar code to be read, which head has an array of optical fibres in a linear array and aligned with the length of a bar code when the reader is correctly located with respect to that bar code, wherein the head is maintained stationary during the reading, wherein light reflected into the fibre ends during the reading is applied to and sensed by a number of electronic devices which are thus responsive to the bar code, and wherein after the head is correctly located with respect to the bar code to be read a scanning circuit associated with the electronic devices is enabled, which scanning circuit causes the conditions of the electronic devices, and hence the bar code with which the head is aligned, to be read, the method and the head being such that a said bar code is read without relative movement between the head and the bar code.

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